AMENDMENTS TO THE CLAIMS

The listing of claims will replace all prior versions, and listings, of claims in the application.

Listing of Claims:

Claims 45-52 (canceled).

53. (Previously Presented) A gyroscopic navigation system, comprising:

a first sensor module, having a plurality of electrical rotational rate sensors, for providing a plurality of rotational rate signals;

a second sensor module, having a plurality of electrical compensation sensors, for providing a plurality of compensation signals;

a microcontroller module, coupled to the first and second sensor modules, for processing the rotational rate signals and the compensation signals and generating attitude information, directional information, and turn coordinate information;

a display, coupled to the microcontroller module, for displaying the attitude information, the directional information, and the turn coordinate information simultaneously;

wherein the rotational rate sensors are made of piezoelectric elements, the piezoelectric elements are made from a single sheet of piezoelectric material;

wherein one of the rotational sensors is a directional gyro, and another rotational sensor is an attitude gyro;

wherein each of the directional and the attitude gyros is a three-dimensional solid-state gyro which comprises:

a substrate having a proof-mass;

a membrane, the proof-mass being suspended on the membrane;

a single common electrode layer being disposed on the membrane; the single sheet of piezoelectric material being disposed on the single common electrode layer; and

a plurality of electrodes being disposed on the single sheet of piezoelectric material in a thin-film format, the rotational rate signals being outputted through the electrodes, wherein each of the electrodes, the piezoelectric material, and the single common electrode layer form a plurality of piezoelectric elements; and

wherein the compensation sensors provide acceleration, magnetic field, and temperature compensation signals to reduce correlated noise caused by acceleration, magnetic field, and temperature.

54. (Previously Presented) The system of claim 53, wherein the piezoelectric elements are arranged and configured in a circular shape with a plurality of pairs of piezoelectric elements, one element in a pair is disposed on an inner ring of the circular shape, and the other element in the pair is disposed on an outer ring of the circular shape.

55. (Previously Presented) The system of claim 54, wherein the two elements of the pair have equal area.

56. (Previously Presented) The system of claim 55, wherein each pair of piezoelectric elements has a mirror image pair of piezoelectric elements disposed on opposite side of an axis passing through a center of the proof-mass.

57. (Previously Presented) The system of claim 53, wherein the piezoelectric elements are arranged and configured in an oval shape with a plurality of pairs of piezoelectric elements, one element in a pair is disposed on an inner ring of the oval shape, and the other element in the pair is disposed on an outer ring of the oval shape.

58. (Previously Presented) The system of claim 57, wherein the two elements of the pair have equal area.

59. (Previously Presented) The system of claim 58, wherein each pair of piezoelectric elements has a mirror image pair of piezoelectric elements disposed on opposite side of an axis passing through a center of the proof-mass.

60. (Previously Presented) An aircraft instrument system, comprising:

a plurality of aircraft primary instruments including a mechanical attitude gyro, a mechanical directional gyro, a mechanical-electrical turn coordinator/slip-skid indicator;

a standby gyroscopic navigation system connected independently of the primary instruments;

electrical power having a primary power source and a battery power source, the primary power source supplying power to the primary instruments and the standby gyroscopic navigation system, the standby battery power source supplying power to the standby gyroscopic navigation system to provide attitude information, directional information, and turn coordination information when the primary power source fails;

wherein standby gyroscopic navigation system includes:

a first sensor module, having a plurality of electrical rotational rate sensors, for providing a plurality of rotational rate signals;

a second sensor module, having a plurality of electrical compensation sensors, for providing a plurality of compensation signals;

a microcontroller module, coupled to the first and second sensor modules, for processing the rotational rate signals and the compensation signals; and

a display, coupled to the microcontroller module, for displaying attitude information, directional information, and turn coordinate information simultaneously;

wherein the rotational rate sensors are made of piezoelectric elements, the piezoelectric elements are made from a single sheet of piezoelectric material;

wherein one of the rotational sensors is a directional gyro, and another rotational sensor is an attitude gyro; and

wherein each of the directional and the attitude gyros is a three-dimensional solid-state gyro which comprises:

a substrate having a proof-mass;

a membrane, the proof-mass being suspended on the membrane;

a single common electrode layer being disposed on the membrane; the single sheet of piezoelectric material being disposed on the single common electrode layer; and

a plurality of electrodes being disposed on the single sheet of piezoelectric material in a thin-film format, the rotational rate signals being outputted through the electrodes, wherein each of the electrodes, the piezoelectric material, and the single common electrode layer form a plurality of piezoelectric elements; and

wherein the compensation sensors provide acceleration, magnetic field, and temperature compensation signals to reduce correlated noise caused by acceleration, magnetic field, and temperature.

61. (Previously Presented) The system of claim 60, wherein the piezoelectric elements are arranged and configured in a circular shape with a plurality of pairs of piezoelectric elements, one element in a pair is disposed on an inner ring of the circular shape, and the other element in the pair is disposed on an outer ring of the circular shape.

62. (Previously Presented) The system of claim 61, wherein the two elements of the pair have equal area.

63. (Previously Presented) The system of claim 62, wherein each pair of piezoelectric elements has a mirror image pair of piezoelectric elements disposed on opposite side of an axis passing through a center of the proof-mass.

64. (Previously Presented) The system of claim 60, wherein the piezoelectric elements are arranged and configured in an oval shape with a plurality of pairs of piezoelectric elements,

one element in a pair is disposed on an inner ring of the oval shape, and the other element in the pair is disposed on an outer ring of the oval shape.

65. (Previously Presented) The system of claim 64, wherein the two elements of the pair have equal area.

66. (Previously Presented) The system of claim 65, wherein each pair of piezoelectric elements has a mirror image pair of piezoelectric elements disposed on opposite side of an axis passing through a center of the proof-mass.